



HighJump Manufacturing Advantage:

How a Manufacturing Execution System (MES) Can Transform Your Operation

In Manufacturing, Improvement Opportunities Abound

When it comes to your supply chain, there is no question that your manufacturing process is the most significant area of value creation. Unlike other nodes in the supply chain, where very little value is being created during the movement, storage and transport of your goods, the shop floor is where you transform purchased materials into your very special product. Thus, the pursuit of improvements is continuous, and often revolves around product quality, production speeds, machine utilization and labor productivity.

Of course, the challenges faced by today's manufacturers are more formidable than ever before, making lasting improvement more difficult. Customers demand first-rate quality, lower costs and rapid delivery. Global competition requires manufacturers to produce at an unprecedented pace, with reductions in defects, waste and cost. Production schedules become outdated just minutes after they are released due to changes in customer demand, material availability and labor. Machine operators struggle to understand the sequence of work to be performed and the availability of component materials needed to complete the work. The vital information the shop floor needs to execute production simply isn't available, resulting in enormous wastes of labor, material and machine utilization.

What if you could eliminate the unexpected from your production operation? What if you were able to foresee issues before they became real manufacturing problems or detect exceptions the moment they occur... instead of spending hours walking the production floor scanning for problems? What if you could do away with the traditional paper-based shop floor environment and create real-time controls to streamline production?

An effective manufacturing execution system (MES) may be your answer. An MES provides the management and synchronization of production tasks with material flow, labor and machine resources to achieve optimal operating performance and customer satisfaction. An MES can drastically improve productivity throughout the entire manufacturing process via the reduction of non value-added activities, an increase in data accuracy, and enforcement of operational and regulatory procedures. Additionally, the MES provides enterprise resource planning (ERP) and order management systems (OMS) with updates on production and inventory activities as they occur.

The number of manufacturers benefiting from MES implementations is on the rise and expected to double (35% to 71%), with more than one third extending these functions into the supply chain. The continued adoption of manufacturing intelligence systems, business analytics, and real-time KPIs will enable continuous improvement and provide the fuel for future innovation.¹

HighJump Manufacturing Advantage: Managing and Directing Workflow for Optimal Operational Output

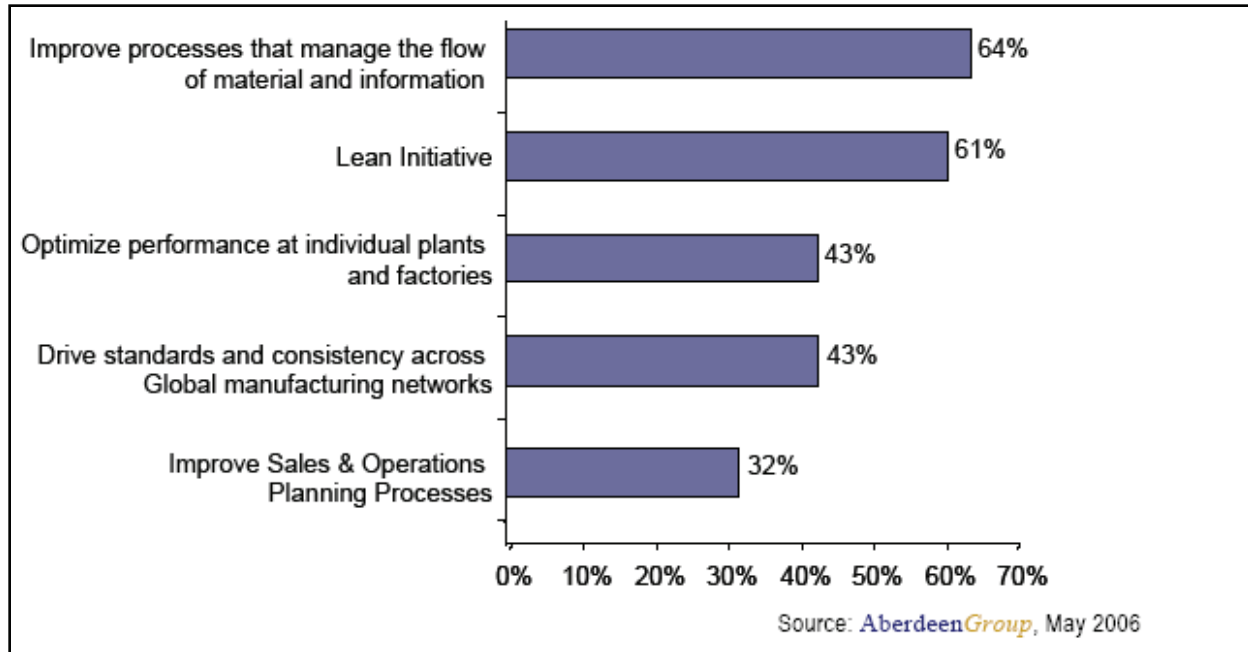
The HighJump™ Manufacturing Advantage solution, a best-of-breed MES, provides a robust approach to managing, optimizing and executing mission-critical manufacturing processes. From receipt of materials, shipping of product and everything in between, HighJump Manufacturing Advantage provides manufacturers with the tools necessary to turn production challenges into competitive advantage.

Built using modern software platforms and architectural philosophies, HighJump Manufacturing Advantage can transform your operation by empowering you to:

- Eliminate waste throughout production – overproduction, waiting, unnecessary inventory, defects
- Reduce labor training and production costs
- Achieve lean production
- Drive continuous improvement (Kaizen)
- Help ensure items are built to specified product quality
- Adhere to customer & regulatory requirements
- Gain real-time visibility into the shop floor

The HighJump MES is the foundation for manufacturing excellence, and has enabled companies world-wide to produce and deliver quality products to their customers.

Best in class strategic actions: *The trait most prevalent among the best manufacturers is effective management of the flow of material and data across their operations*



A Day at the Plant With HighJump Manufacturing Advantage

How does HighJump Manufacturing Advantage really make a difference in your day-to-day operations? Following are ten key steps in the manufacturing process, illustrating a typical day at the plant where the HighJump MES is being used by shop floor schedulers, machine operators, material handlers, quality inspectors, supervisors, managers and IT administrators.

1. Core Data Imported Into HighJump Manufacturing Advantage

One main function of HighJump Manufacturing Advantage is to direct work order execution and reporting performed by shop floor employees and machines. This function is surrounded by many other capabilities, described below. As part of directing work order execution, HighJump Manufacturing Advantage must contain critical “core” data. This data can be imported into the MES from another system (such as an ERP) using pre-defined interfaces. Alternatively, the data can be created by plant engineers, inventory controllers or IT administrators who use HighJump Manufacturing Advantage. This data includes:

- **Items** – all unique raw materials, semi-finished and finished goods
- **Bills of materials** – the inputs required for making a semi-finished or finished good
- **Routes** – the sequential steps/operations, from work cell to work cell, used to manufacture a product
- **Work centers, work cells, machines**
- **Employees** – machine operators and material handlers
- **Documents** – file attachments associated to items, machines or quality test plans
- **Events and alerts** – monitoring mechanisms that alert supervisors and managers to unexpected events, such as under-production, defective parts or slow production times

2. Work Order Import, Prioritization and Dispatch

After the input of all core data, HighJump Manufacturing Advantage is ready to run the plant. A typical day probably starts with the MES receiving production schedules (i.e., the master production schedule) from an ERP, OMS or advanced planning system (APS). These schedules, which are planned hours or days in advance, are predominantly based on a “perfect world” shop floor scenario. This scenario assumes that machines are “up” and operational throughout the day, customer orders remain unchanged, labor staffing is optimal, and yield rates are standard. While ideal, this scenario rarely plays out in real-world manufacturing environments. All too often, a large gap exists between the “perfect world” plan and the realities of “real world” challenges on the shop floor.

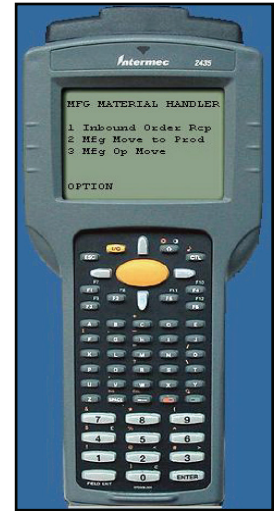
3. Material Picks and Delivery to Work Cells

After the schedule has been dispatched, the system is helping material handlers to efficiently deliver essential components to work cells. The MES allows you to request the materials you need to be delivered to the work cell.

4. Work Queue, Instruction and Documentation Review at Work Cells

As mentioned above, one of the key duties of HighJump Manufacturing Advantage is to guide shop floor operators through the execution of work orders. From the moment the operator logs into the MES at the beginning of the shift, the system enables him or her to do the job efficiently and accurately.

HighJump Manufacturing Advantage provides a single, electronic, real-time source of the total work queue for the work cell via a Web-browser. With a touchscreen-friendly user interface, operators have constant access to information showing which orders have the highest priority and should be completed first.



Operator Certifications and Crews

When an operator logs onto HighJump Manufacturing Advantage, his or her credentials are automatically verified prior to starting a job or machine. Additionally, HighJump Manufacturing Advantage supports the use of work cell crews, whereby a crew leader signs in and out once for the entire crew, providing an effective and fast method for tracking labor for large groups of shop floor personnel.

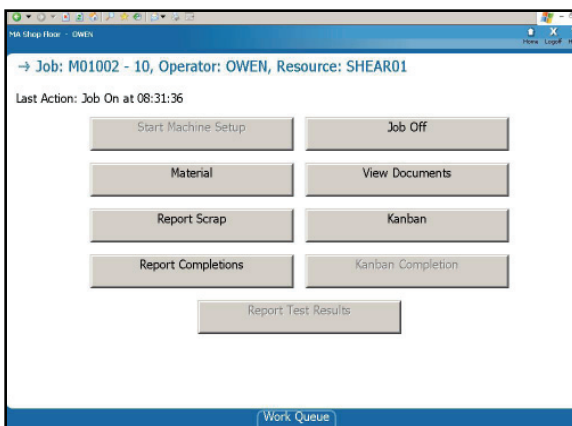
#	Resource	Machine Status	Priority	Job-Op	Item Number	Completed	Operator
2	SHEAR01	Running	60	M01008 - 10	66012	0 OF 50	OWEN
4	SHEAR01	Next Jobs	55	M01002 - 10	NNFG60033	0 OF 200	
5	SHEAR01	Next Jobs	50	M01009 - 10	NNFG60033	0 OF 50	
7	SHEAR01	Jobs Completed	50	M01004 - 10	NNFG80081	200 OF 200	
8	SHEAR01	Jobs Completed	50	M01005 - 10	ONFG50025	20 OF 20	
9	SHEAR01	Jobs Completed	50	M01015 - 10	NNFG60033	650 OF 650	

5. Production Activity Recorded at Work Cells

From this point forward, HighJump Manufacturing Advantage tracks all activity for each work order. Through intuitive screens with menus and data entry prompts, the operator enters information into the system through the touchscreen-friendly user interface. The data entered includes:

- Direct and indirect labor time for each shop floor operator (via either individual or crew reporting)
- Machine set-up, running and downtime, along with downtime reason codes
- Components used on (issued to) the work order, including validation of lot or serial numbers
- Output material completions, including assignment of lot or serial numbers
- Components scrapped, along with scrap reason code assignment
- Output material scrapped, along with reason codes

Throughout the data entry process, HighJump Manufacturing Advantage helps ensure that it is difficult to make mistakes. For example, when issuing components to a work order, the user interface allows only component items that exist for the specific BOM to be issued. Also, the use of bar code scanners is supported to eliminate the need to type on a keyboard. In all situations, HighJump Manufacturing Advantage makes the job of entering production activity easy and virtually error-proof.

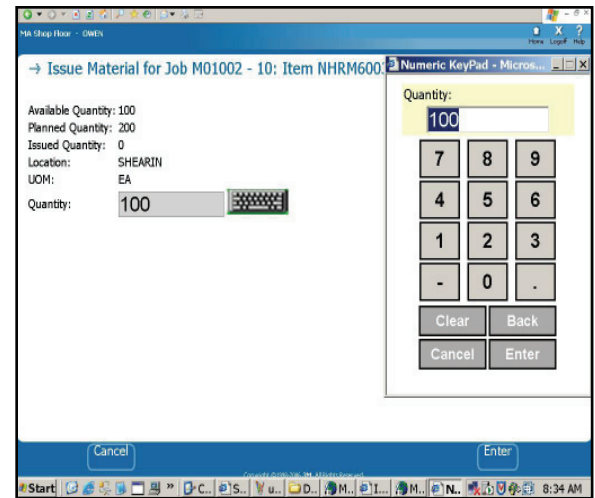


The benefit of this extensive data is plentiful. For one, the information allows managers to perform accurate job costing, as well as generate valuable labor, machine and inventory performance metrics. These metrics may be utilized to identify individual training opportunities, support performance-based pay incentives, and optimize machines and labor for upcoming production runs.

Additionally, this information creates a full genealogy of every product made. The genealogy is built automatically by the system when materials are issued to the job and completions are recorded, saving the immense time required for manual collection of this data.

The product genealogy includes:

- Who made it
- With which machine(s)
- Which other products were made on the same machine in a given timeframe (in case of defect)
- Which materials are in the product
- How much scrap was produced
- Data to determine cost to make each part
- Multi-level lot tracking



Data Capture Directly from Machines

In environments where complex machinery is used to manufacture materials, additional opportunities exist to automate the capture of production information.

These complex machines, often controlled by programmable logic controllers (PLC) or computers, rely on work instructions which describe how the machine shall operate for each product produced. This set of instructions, termed a 'recipe,' identifies machine control parameters such as speed, temperature, clamp pressure and dwell time, and must be downloaded to the machine prior to the start of production.

Once production is initiated, the machine may monitor specific events that occur, such as when each clamp cycle begins, what the current oven temperature is, or when a unit of material is output. By communicating to these machines via standard automation communication methods, HighJump Manufacturing Advantage may automatically collect this data from the machines in real time. It can then be incorporated into production, downtime and inventory tracking and reporting activities.

6. Material Replenishments Requested

In the paper-based world where there is one material handler per line, the worker may sometimes find him or herself without the material needed to do the job. Using HighJump Manufacturing Advantage, an operator can request material replenishments as he or she deems necessary, and those requests are quickly transferred to the material handling work queue.

7. Real-Time Production Review and Adjustment

Throughout the day, schedulers, supervisors and managers can leverage the real-time data being collected in HighJump Manufacturing Advantage to further streamline and optimize the activity on the shop floor. By monitoring work cell throughput, schedulers can quickly rearrange work cell priorities to perfect the shift's activities. Additionally, quality supervisors can track product quality levels, and if necessary, quickly implement updated quality plans.

Also, since the only constant on the shop floor is that changes will be needed, HighJump Manufacturing Advantage allows for quick and optimal response to those changes. Whether it's a hot new customer order, a machine that has gone down, or a crew that had a worker go home sick for the day, schedulers and supervisors may readjust work order priorities and electronically dispatch those changes to the shop floor where they'll be visible right away. This greatly reduces the need to walk around, redistribute any paper travelers, and verbally inform everyone of the new order for the shift.

Resource ID	Status	Reason	Work Center	Shift	Date	Operator	Last Change
1	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
2	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
3	WORKING		WORKING	WCS01	08/08	CAROL OPERATOR	10/05/2007 04:17 AM
4	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
5	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
6	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
7	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
8	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
9	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
10	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
11	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
12	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
13	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
14	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
15	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
16	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
17	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
18	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
19	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM
20	WORKING		WORKING	WCS01	08/08	CHRISTINA OPERATOR	10/05/2007 05:17 AM

Item Number	Location#	Available Quantity	Lot Number	Uls
1	HRM00001	10		1
2	HRM00002	10		1
3	HRM00001	10		1
4	HRM00001	100		1
5	HRM00001	100		1
6	HRM00001	10		1
7	HRM00001	100		1
8	HRM00001	100		1
9	HRM00001	100		1
10	HRM00001	100		1
11	HRM00001	100		1
12	HRM00001	100		1
13	HRM00001	100		1
14	HRM00001	100		1
15	HRM00001	100		1
16	HRM00001	100		1
17	HRM00001	100		1
18	HRM00001	100		1
19	HRM00001	100		1
20	HRM00001	100		1

Order Number	Facility	Item Number	Revision	Quantity	MPM	Due Date	Priority	Status	Current On Hand	Current Stock	Critical Ratio	BOM %
1	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	0.000000000000000000	1.000000000000000000	100%
2	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
3	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
4	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
5	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
6	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
7	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
8	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
9	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
10	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
11	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
12	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
13	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
14	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
15	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
16	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
17	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
18	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
19	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%
20	HRM001	HRM00001	1	100.00000000	EA	10/05/2007	50	Released	30	1.000000000000000000	1.000000000000000000	100%

WIP inventory and manufacturing order screens

8. Performance Analysis

You have learned through the first seven steps how HighJump Manufacturing Advantage helps ensure your products are produced accurately and on time through real-time monitoring and production directing. There are many other ways in which HighJump Manufacturing Advantage can help you continuously improve production, namely through the robust reporting and analytics the system provides. Here are some of the ways to leverage the information in the HighJump MES.

Scrap Reporting

When your plan is on paper, you have very little or no data on how you actually performed. A paper-based system can be wrought with transcription errors, incorrect part numbers, or a simple lack of data. This makes it virtually impossible to do gap analyses to improve future performance.

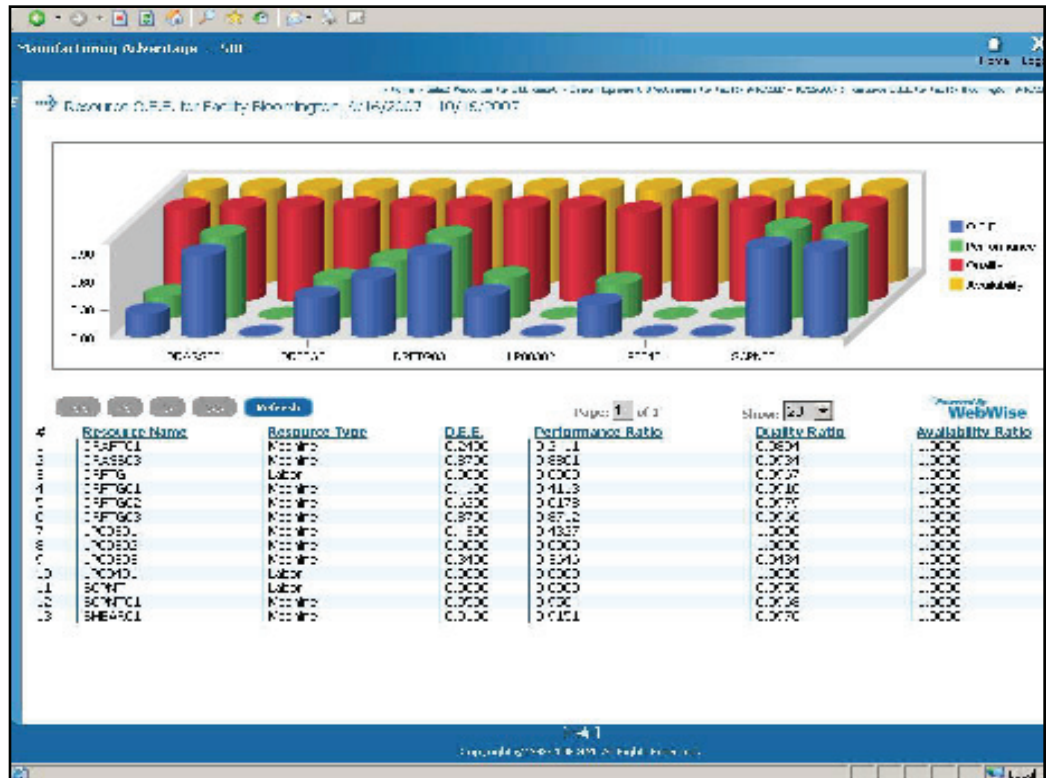
By contrast, HighJump Manufacturing Advantage automatically collects useful data throughout the production process, which will be used to analyze performance against your pre-defined scrap standards:

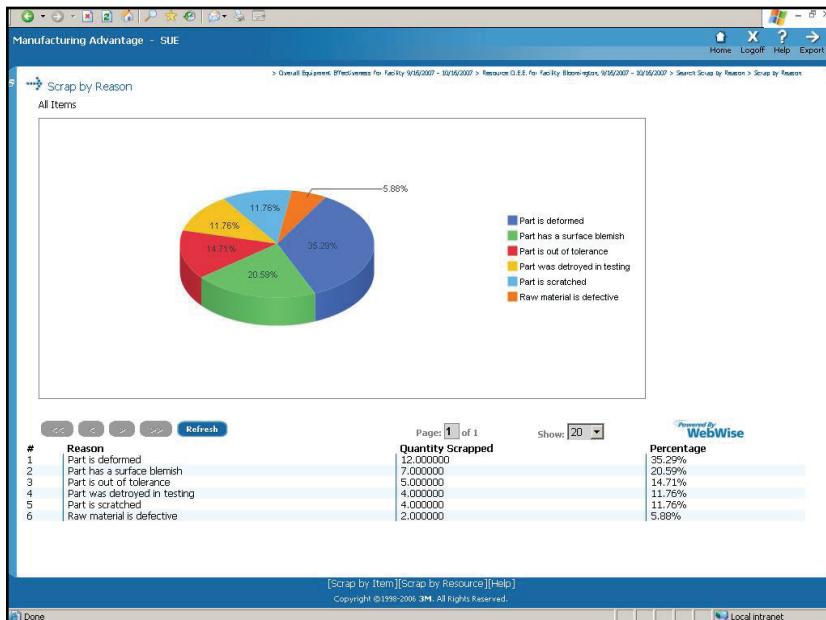
- How much scrap was produced
- Which worker and crew produced it and in which work center
- At what time was the scrap produced

By knowing when and why scrap occurred, production managers can identify areas for improvement and then monitor whether alterations make an impact.

Machine Utilization

A lack of insight into machines operating outside control limits, or unavailability of downtime and maintenance time, can result in delayed customer shipments and poor quality.





HighJump Manufacturing Advantage takes away the guessing games involved in determining how efficient your machines are and how you can improve. The system enforces real-time recording of machine-related data, allowing you to track what has happened with each machine and work center. Examples of this include:

- How many times has a certain component failed?
- What is the tracked machine utilization?
- What is the percentage uptime and downtime for the machine?
- How often is product running through the machine versus the potential output of the machine?

Labor Productivity

Since all operators or crews using HighJump Manufacturing Advantage record their time for each work order, supervisors and managers can evaluate how those people are performing against standards. This allows management to better incent and reward the work force, as well as understand when to update the standards to push even better productivity.

Yields

By comparing expected throughput/capacity rates with actual production, Manufacturing Advantage can easily calculate and report on yields. These reports can show yields by product, work cell or down to the specific machine. Having this data available allows production management to target areas for improvement, and also give accurate assessments and estimates to other arms of the organization.

Technology Highlights of HighJump Manufacturing Advantage

As part of the HighJump suite of supply chain execution solutions, HighJump Manufacturing Advantage is a best-in-class MES when it comes to strength of technology and low total cost of ownership. Maintaining and tailoring HighJump Manufacturing Advantage after installation is easy on the IT department, and is supported by a world-class technical support staff at HighJump Software. Some of the key technology features of the system include:

- All user interfaces are either rendered via a Web browser or on standard character-based RF terminals (for material handlers). This reduces IT support needs, as software is not installed on any PC or handheld devices.
- All user interfaces, transaction processing and workflows are built on HighJump Software's Advantage platform. Extensive tailoring can be done to the system without any code-based changes due to HighJump Software's service-oriented architecture (SOA) approach. Additionally, the platform enables easy integration to leading ERP and APS packages, as well as PLCs or SCADA systems.
- The HighJump platform and adaptability tools are all built with modern Microsoft technologies including an open database architecture which supports easy access to data.

Your Operations—Transformed Using HighJump Manufacturing Advantage

As you've now learned, HighJump Manufacturing Advantage replaces error-prone, paper-based communication with a streamlined, digital shop floor environment. Streamlining your operations with the HighJump MES can yield immediate, tangible reductions in costs associated with inventory, labor, compliance with regulatory requirements and quality assurance.

In summary, here are some of the areas in which HighJump Manufacturing Advantage can transform your manufacturing operations:

- **Accurate job costing and tracking:** HighJump Manufacturing Advantage collects labor time, machine data, components used and output material completed. These are all critical in helping calculate the true costs of your production. Having this data helps you identify areas for improvement and allows you to continuously measure performance against those improvements.
- **Reduced labor costs:** HighJump Manufacturing Advantage tells each shop floor operator exactly what to do next. This helps them prioritize and their work, preventing mistakes and rework along the way. Additionally, every operator or crew using HighJump Manufacturing Advantage records the time for each work order, allowing supervisors and managers to evaluate performance against standards. This allows management to better incent and reward the work force, as well as understand when to update the standards to push even better productivity.
- **Decreased cycle times:** HighJump Manufacturing Advantage provides intelligent work dispatch, accurate production execution, and seamless coordination between material handling and the work cells. All of this leads to streamlined material flow and lower cycle times.
- **Enhanced quality:** By helping to ensure that all necessary data is collected, and validating that the results meet appropriate criteria, HighJump Manufacturing Advantage drives production reporting and quality inspections. This leads to fewer defective products making it through the process.
- **Improved customer satisfaction:** All of the above lead to the most important benefit of all: pleasing your customers. By using HighJump Manufacturing Advantage, you can deliver your products with higher quality, lower costs and better on-time predictability.
- **Outstanding system configurability:** HighJump Software's highly adaptable and flexible solutions allow you to adapt your software quickly and easily to changing business environments without excessive costs or disruption to ongoing operations - and without modifying source code.

In sum, HighJump Manufacturing Advantage provides the management and synchronization of production tasks with material flow, labor and machine resources to achieve optimal operating performance and customer satisfaction.

About HighJump Software

Forward-thinking companies entrust HighJump Software to power their supply chains. HighJump Software simplifies the art and business of creating, selling and moving products across global networks. HighJump Software helps more than 1,300 clients worldwide drive growth and manage change.

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